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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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03/20/2001

Robert J. McCarty JR.

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09/29/2004

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EXAMINER

TRAN, KHANH C

ART UNIT

PAPER NUMBER

2631

DATE MAILED: 09/29/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/813,266

Applicant(s)

MCCARTY, ROBERT J.

Examiner

Khanh Tran

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 20 March 2001.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-20 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 14-20 is/are allowed.
- 6) ☒ Claim(s) 1-3, 5-9, 12 and 13 is/are rejected.
- 7) ☒ Claim(s) 4, 10 and 11 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 11 April 2001 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____.
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date _____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____.

DETAILED ACTION

Drawings

1. The drawings are objected to under 37 CFR 1.83(a). The drawings must show every feature of the invention specified in the claims. Therefore, the claimed limitations "a pulse shape filter coupled to receive control signal from a synchronization unit" and the claimed limitations "a synchronization unit comprising a detector as set forth in the claim, an accumulator as set forth in the claim, a sample bins as set forth in the claim, a comparator as set forth in the claim, an identifier as set forth in the claim, and a control signal generator as set forth in the claim" in claim 14 must be shown or the feature(s) canceled from the claim(s). No new matter should be entered.

Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The figure or figure number of an amended drawing should not be labeled as "amended." If a drawing figure is to be canceled, the appropriate figure must be removed from the replacement sheet, and where necessary, the remaining figures must be renumbered and appropriate changes made to the brief description of the several views of the drawings for consistency. Additional replacement sheets may be necessary to show the renumbering of the remaining figures. The replacement sheet(s) should be labeled "Replacement Sheet" in the page header (as per 37 CFR 1.84(c)) so as not to obstruct any portion of

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the drawing figures. If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Claim Objections

2. Claim 14 is objected to because of the following informalities: in line 12, "a synchronization" should be changed to -- said synchronization --. Appropriate correction is required.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

3. Claims 1-3, 5-9, and 12-13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kroeger et al. U.S. Patent 5,768,323.

Regarding claim 1, Kroeger et al. invention is directed to a method and apparatus for synchronizing symbol timing for a QPSK demodulator utilizing a Matched Filter Pair and Symbol Synchronizer shown in figure 8. Figure 2 illustrates a demodulator including the Matched Filter Pair and Symbol Synchronizer 240, and Symbol Sync Estimator 250.

- Referring to the demodulator in figure 2, an analog signal is received and converted to a digital signal 206. The signal comprises a periodic information bearing signal having a information rate and period T_s , which is the inverse of information rate.
- The A/D converter 210 samples the analog signal at sampling rate greater than the symbol rate.
- Kroeger et al. does not expressly disclose the step of performing filtering during a first predetermined number of information periods. Referring to figure 8, in column 12 line 14 through column 13 line 20. Each incoming (I and Q) symbol is represented 8 samples. The matched filters 802 and 804 span several or more symbol periods to minimize intersymbol interference (ISI) while approximating root-Nyquist characteristics. In view of the foregoing, because several or more symbol periods are needed to avoid ISI, it would have been obvious for one of ordinary skill in the art that several or more symbol periods correspond to the claimed limitation "*a predetermined number of information periods*". And each of matched filters receives the symbol periods, and processes each sample point by using 8 sets of matched filtered coefficients. The matched filters correspond to the claimed pulse-shaping filter. In column 13 lines 4-20, matched filters 802 and 804 produce three outputs (e.g. early, punctual and late signals) for each I and Q signal path. The early and late signals

are used to adjust the timing of the filters, and the punctual signal is an information bearing signal.

- In column 13 line 15-51, the 8 sets of matched filtered coefficients correspond to the claimed variable. Figure 18 shows an example of a sample of the timing of the matched filters lagging the timing of the incoming symbol, and the effect of changing to a different set of the eight sets of filter coefficients in accordance with an interpolation control signal 872. Each of the early, punctual and late signals uses one of eight possible sets of filter coefficients. A symbol synchronizing estimator 250, connected to the plurality of matched filters, receiving from each of the pair matched filters the early signal and the late signal and outputting a three-bit interpolator control signal 872. In light of the foregoing discussion, for each set of the eight sets of filter coefficients, the variable is measured at each sample point (e.g. early, late, punctual signals). Furthermore, the variable is independent of information content in the received symbols.
- As disclosed in column 13 lines 39-43, see figure 19, if the punctual filter output is centered on a symbol, the outputs of the early and late filter outputs are equal. If the punctual filter output is not centered on a symbol, the early and late outputs are unequal. Hence, this step corresponds to the claimed step of determining the location of information bearing point in the received signal.

- As recited above, if the punctual filter output is not centered on a symbol, the early and late outputs are unequal, the three-bit interpolator control signal 872 selects another set of the eight sets of filter coefficients until the punctual filter output is centered. At that time, the information bearing point is identified.
- Referring to figure 8, symbol synchronization is established when the interpolation control sets the matched filter timing coincident with incoming symbol timing, see column 12 lines 28-34. The punctual filter output, information bearing signal, are passed out of the synchronizer, see figure 8. That step corresponds to the claimed synchronizing processing.
- Kroeger et al. does not expressly disclose the claimed step of during a second number of subsequent information periods, filtering a subset of the N sample points for each subsequent information period. As recited above, symbol synchronization is established when the interpolation control sets the matched filter timing coincident with incoming symbol timing. After the timing is achieved, it would have been obvious for one of ordinary skill in the art that matched filters continue filtering incoming symbols without making any adjustments until the matched filter timing is off again. The late, punctual, and early signals are equivalent to a subset of the sample points as claimed in the instant application. The claimed

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number of subsequent symbol periods corresponds to the period between the matched filter timing is on and off again..

Regarding claim 2, the late, punctual, and early signals consist of the information bearing signal, and each adjacent sample point.

Regarding claim 3, the late, punctual, and early signals consist of the information bearing signal, one preceding and one subsequent sample point of the sample points as appreciated by one of ordinary skill in the art.

Regarding claim 5, Kroeger et al. does not expressly disclose the claimed steps of interpolating between sample points during the first predetermined number of information periods and interpolating between the subset of N sample points during the second number of subsequent information periods. However, in column 12 lines 60-65, the matched filters are capable of providing very fine resolution through interpolation without increase sampling rate. The interpolation places virtual sampling points between the actual sample points. Because interpolation is always performed in the matched filters, it would have been obvious for one ordinary skill in the art at the time the invention was made that interpolation process is equivalently performed before the matched filter timing coincides with incoming symbol timing, and also after the symbol timing is achieved.

As recited in claim 1, symbol synchronization is established when the interpolation control sets the matched filter timing coincident with incoming symbol timing. Otherwise, the matched filter timing is adjusted by using one of eight sets of filter coefficients in each filter. Hence, the symbol synchronizing estimator tracks the early, punctual, and late signals resulting from the interpolation step, and update the signals by generating the three-bit interpolation control signal. The early, punctual, and late signals correspond to a subset of sample points.

Regarding claim 6, as disclosed in column 13 lines 39-43, see figure 19, if the punctual filter is not centered on a symbol, the early and late outputs are not equal. Consequently, the punctual filter is more than halfway between the early and late outputs. Hence, the matched filter timing is adjusted by using one of eight sets of filter coefficients in each filter.

Regarding claim 7, Kroeger et al. gives an example of 8 samples per symbol (see column 12 lines 65-67) containing information bearing point (symbol timing). It would have been obvious for one of ordinary skill in the art that the claimed limitation *"thirteen sample points for each information bearing point"* is a matter design choice

Regarding claim 8, Kroeger et al. teachings apply to QPSK modulation, but do not disclose QAM modulation. Nevertheless, QAM is a design choice of another

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modulation scheme, therefore, it would have been obvious for one of ordinary skill in the art that Kroeger et al. teachings can be modified to apply to QAM modulation scheme.

Regarding claim 9, as disclosed in column 12 lines 52-55, the matched filters 802 804 in figure 8 approximate root-Nyquist characteristics.

Regarding claim 12, since the second number of information periods is claimed to be a variable, meaning any number of symbol periods, the claimed limitation is within Kroeger et al. teachings.

Regarding claim 13, the claimed number of information periods corresponds to the time period when the matched filter timing is off and is resynchronized again.

Allowable Subject Matter

4. Claims 4, 10-11 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

5. Claims 14-20 allowed.

Regarding claim 14, said claim is allowed because prior art of record cannot teach or suggest a receiver capable of synchronizing with a received signal, the receiver comprises detailed components as set forth in the claim.

Conclusion

6. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Valimaki et al. U.S. Patent 5,812,608 discloses "Method and Circuit Arrangement for Processing Received Signal".

Legrand et al. U.S. Patent 6,674,822 B1 discloses "Searching The Optimal Sampling Instant in a TDMA Packet Transmission System".

Temerinac U.S. Patent 6,477,215 B1 discloses "Sampling Control Loop for a Receiver for Digitally Transmitted Signals".

Legrand et al. U.S. Patent 6,628,736 B1 discloses "Estimating The Optimal Sampling Instant in a TDMA Packet Transmission System".

7. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Khanh Tran whose telephone number is 571-272-3007. The examiner can normally be reached on Tuesday - Friday from 08:00 AM - 05:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mohammad Ghayour can be reached on 571-272-3021. The fax phone

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number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

KCT

A handwritten signature in black ink, appearing to read 'Khanh Cong Tran'. The signature is written in a cursive, flowing style.

KHANH TRAN